Work (Scientific Definition):

[Brainstorm ideas]

- Converting force into energy
- Act of applying energy over time
- Applying force to an object
- Something that deals with distance
- Moving something over a distance
- Amount of energy that it takes to move something over a distance

"Official" Scientific Definition of Work:

$$\text{Work} = (\overline{\text{Force}})(\overline{\text{displacement}})$$

↳ scalar ↳ vector ↳ vector

- Short aside: two ways to multiply vectors

1. Dot product → gives scalar answer
   [We will do this!]

2. Cross product → gives a vector answer
   [We will NOT do this]

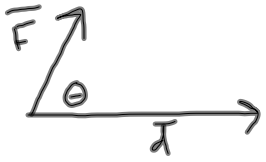
$$W = \bar{F} \cdot \bar{d}$$

$$= F d \cos\theta$$

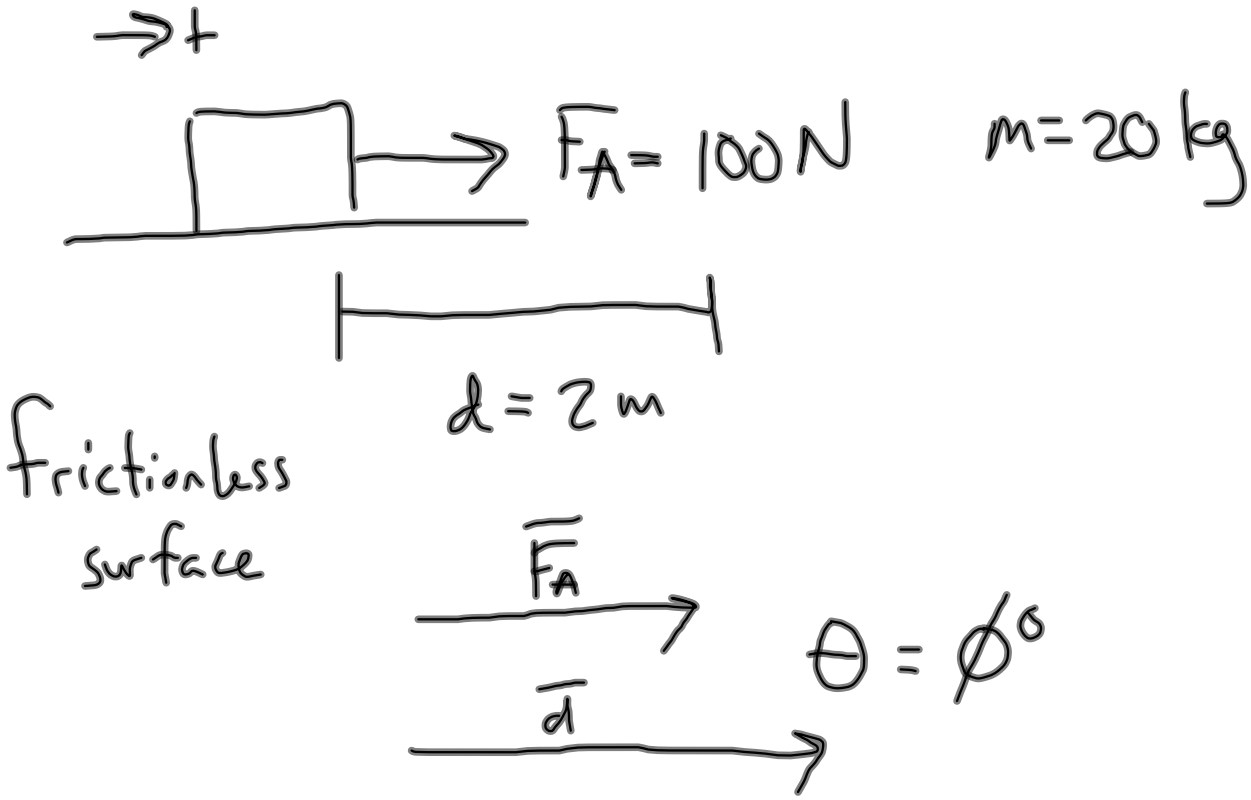
↳ angle between $\bar{F}$ and $\bar{d}$

↳ magnitude of $\bar{d}$

↳ magnitude of $\bar{F}$



Unit: Joule (J) $= N \cdot m = \frac{kg \cdot m^2}{s^2}$

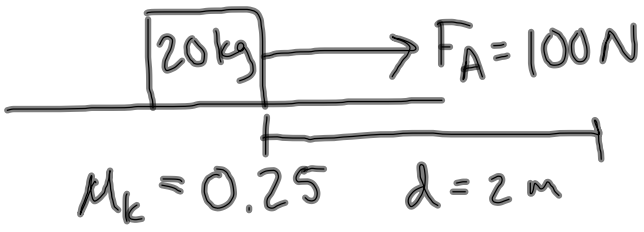


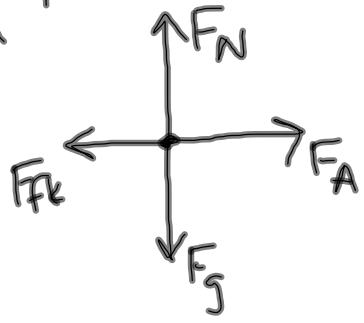
$$W_{net} = W_A$$

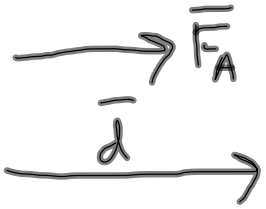
$$= F_A\, d \cos\theta$$

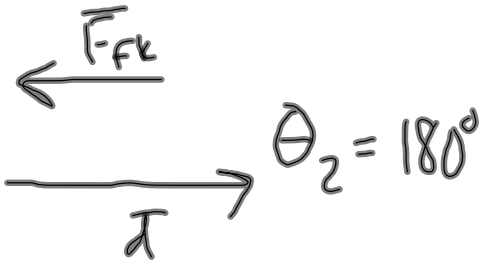
$$= (100\,N)(2\,m)\cos(0^\circ)$$

$$= 200\,J$$









$$W_{net} = W_A + W_f$$

$$= F_A d \cos\theta_1 + F_{fk} d \cos\theta_2$$

$$= (100\,N)(2\,m)\cancel{\cos(0°)^1} + (49\,N)(2\,m)\cancel{\cos(180°)^{-1}}$$

$$= 102\,J$$

$$F_{fk} = \mu_k F_N$$

$$= (.25)(196\,N)$$

$$= 49\,N$$

$$\Sigma F_y = 0$$

$$F_N - F_g = 0$$

$$F_N = F_g$$

$$= 196\,N$$